REMARKS

This Amendment is responsive to the Office Action of March 17, 2008. Reconsideration and allowance of claims 1-14 are requested.

The Office Action

Claims 1-11 stand rejected under 35 U.S.C. § 103 as being unpatentable over Nagayama (US 5,816,782) in view of Biais (US 5,793,178).

Claims 12-14 do not stand rejected on art, and are understood to contain allowable subject matter.

The Present Amendment is Supported by the Application

The amendment which starts in line 7 of claim 1 is supported by page 4, lines 5-6 of the specification. The amendment to the end of claim 1 finds antecedent basis at least on page 4, lines 24-25 and on page 8, lines 17-19.

The amendment to claim 11 finds antecedent basis at page 4, lines 5-6, and 24-25, and on page 8, lines 17-19.

The Claims Distinguish Patentably Over the References of Record

Nagayama does not disclose a synchronous motor power limiting device. Biais does not disclose a synchronous motor power limiting device as set forth in claim 1. The power limiting means according to Biais does not limit compression induced heating in the motor rotor to a constant value at higher speeds. Biais does not even address the problem of compression induced heating. Moreover, the motor torque limitation described at column 4, lines 27-36 and Figure 3 of Biais is not reciprocally proportional to the motor speed as the motor speed increases. Rather, the torque is represented by curve 36 in Figure 3 of Biais (column 4, line 36). Clearly, the motor torque reduction according to Biais does not result in limiting compression induced heating *to a constant value*.

Claim 1, on the other hand, defines the motor torque decrease to be *reciprocally proportional* to the motor speed rather than being a curve.

Not only does Biais not disclose the reciprocal proportional motor torque decrease, Biais also does not disclose decreasing the motor torque by changing the

stator current. In column 4, lines 60-62, Biais mentions that the curve supplied to the undulator must drop. This is, however, mentioned in a different context, namely, in order to oppose the back e.m.f. of the motor (column 4, lines 58-59). This is not in the context of the motor torque reduction being reciprocal or proportional to the motor speed in order to limit compression induced heating to a constant value. The decrease of torque C shown in Figure 3 of Biais is achieve by pulse-width modulation and by controlling the phases of the currents in the stator windings.

Nagayama does not deal with the question of compression heat and does not deal with the question of how an abrupt increase of compression heat, as is the case if there is a high pressure gas breakthrough at the suction side of the pump, can be avoided.

In the prior art, the compression heat in a vacuum pump is controlled by a control circuit which controls the pressures and temperatures of the gas inflow and of the gas outflow or controls the temperature of the pump rotor itself.

A basic problem of a displacement vacuum pump is the phenomenon of compression heat. Since a gas vacuum is a very poor heat conductor, the heat of the rotor can be discharged from the rotor only at a very low rate such that the compression heat has to be limited to a relatively low maximum. The generated compression heat rate is, in motor terms, dependent upon the motor speed and the torque generated by the motor, and, in electrical terms, dependent upon the electrical power delivered to the motor.

Typically, DC motors are used to drive a vacuum pump, more typically a brushless DC motor, such as described in Nagayama. The Nagayama DC motor is not suited for controlling the motor power.

Nagayama does not deal with the question of motor power or compression heat. As a consequence, the Nagayama document provides no suggestion or even leads one to consider, much less solve, the problem of avoiding overheating of the vacuum pump rotor, much less solving this problem by manipulating motor power.

In contrast to Nagayama, the present application improves overheating protection for the vacuum pump. This solution is achieved by using a motor, which is configured as a synchronous motor, and not as a DC motor or as an asynchronous motor. Generally, the possibilities of controlling motors of the present type are much more variable than with a brushless DC motor. In addition, the heat generation in the

motor of the present application is much less than the motor of an asynchronous motor.

The present motor gives the possibility of providing a power limiting device 58 which limits the motor power P_M to a fixed maximum motor power P_{Mmax} in a limiting range above a fixed rated motor speed, which avoids any additional heat induction into the motor rotor, as would be the case with an asynchronous motor or the Nagayama motor.

In other words, the rotational speed n of the present motor can be increased to values above the nominal rotational speed n_N by reducing the motor torque M_M so that the motor performance is limited to a constant maximum motor power in the limiting motor speed range, i.e., the speed range above the nominal rated motor speed n_N.

Instead of reducing the motor speed to avoid overheating as is conventional in the art, the present application allows an increase in the motor speed while the motor torque is reduced. By limiting the motor power P_M, it is possible to increase the motor speed n when the input pressure is low so that a high volume gas flow is possible. By limiting the motor power P_M, overheating of the vacuum pump and, in particular, of the rolling pistons, is reliable and inherently prevented. A separate intelligent control for the pressure and the rotor temperature is not necessary and can be omitted without risking overheating the pump.

Biais is directed to a synchronous motor for driving an ***electric vehicle***. Biais does not deal with the question of how overheating of a machine which is driven by an electric motor can be avoided. Biais only deals with the question of how the torque of the electric motor can be maximized over the range of 0-2000 RPM. The limiting factor of the electric motor and the electric vehicle described in Biais is an overheating of the motor and the motor stator windings, but not an overheating of the machine connected to and driven by the motor.

Thus, Biais makes no suggestion to those of ordinary skill in the art how a very simple limiting of compression heat in a displacement pump can be achieved.

Claim 11 Distinguishes Patentably Over the References of Record

In the "Response to Arguments" section of the Office Action, the Examiner notes that Nagayama does not deal with the question of compression heat. Biais, being directed to a motor vehicle drive, similarly is not concerned with compression heat. **Claim 11** has been amended to expressly set forth the limiting of compression induced heating. Accordingly, it is submitted that claim 11 distinguishes patentably and unobviously over the references of record.

CONCLUSION

For the reasons set forth above, it is submitted that claims 1-14 distinguish patentably and unobviously over the references of record. An early allowance of all claims is requested.

Respectfully submitted,

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